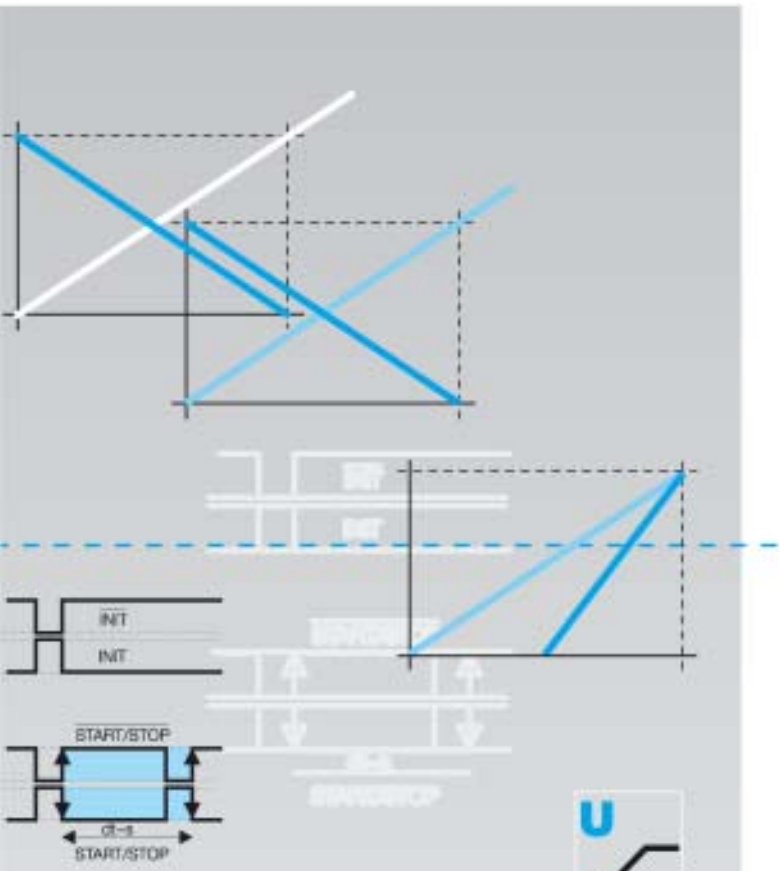
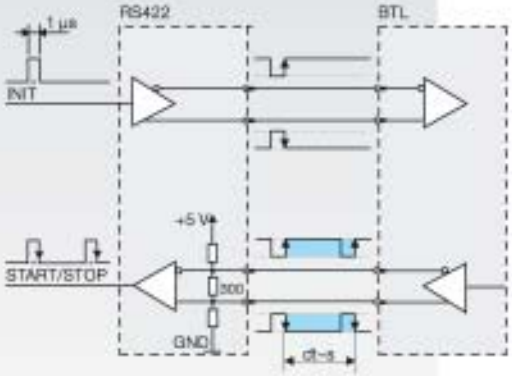




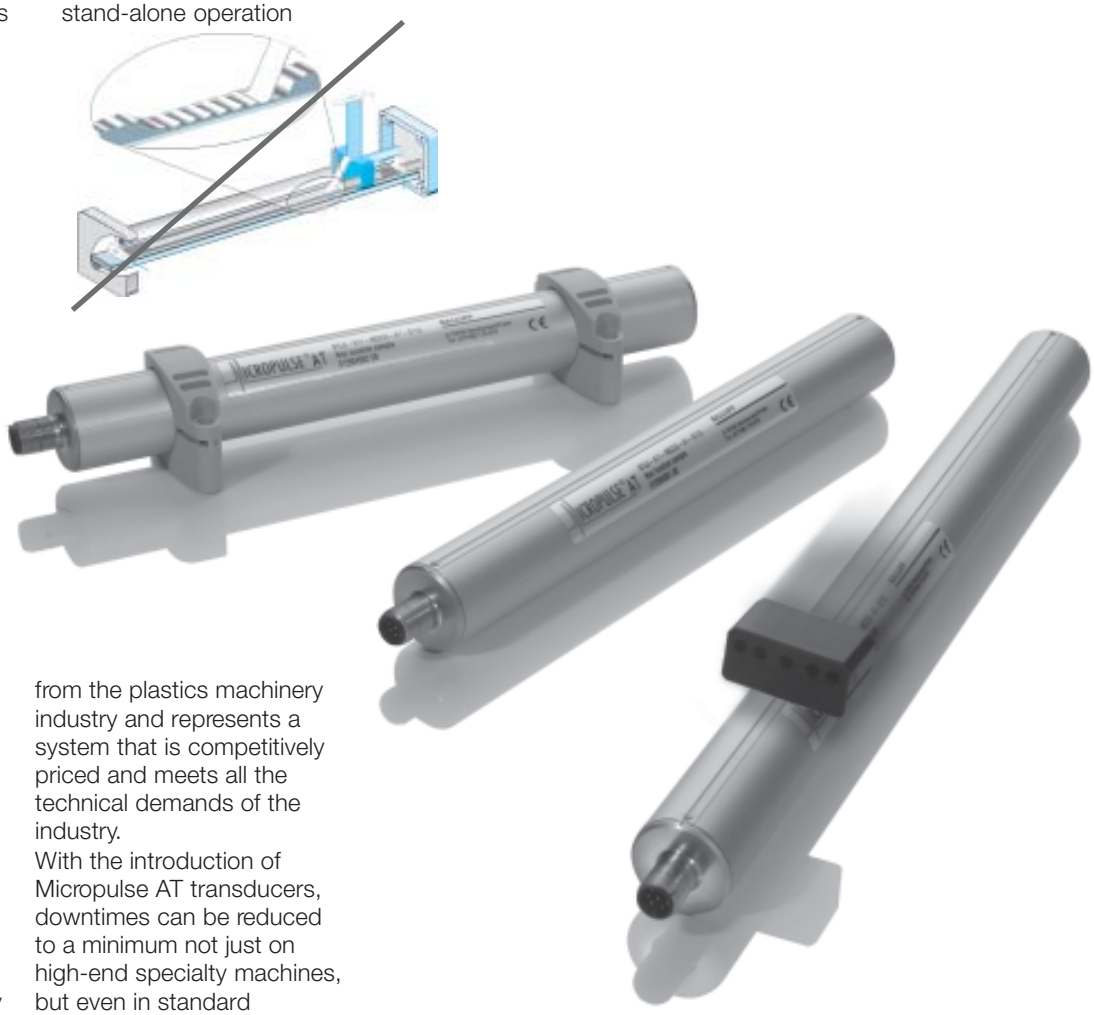
AT.2 General data Profile series A1
AT.4 Digital pulse interface P11_
AT.6 Analog interface Profile series A1
AT.8 Operating modes
AT.9 Analog interface Profile series A1
AT.10 Accessories Profile series A1

Easy and flexible installation

Micropulse Transducers – a non-contact alternative to contacting feedback devices

Balluff Micropulse AT transducers in profile housings are a non-contact alternative to wear-prone potentiometers while offering a higher degree of protection and ease of installation.
The linear sensing element is protected in an aluminum extrusion.
The measuring point along the sensing element (wave-guide) is indicated by a passive marker (magnet), which needs no power.
Measuring stroke ranges between 50 and 1500 mm are available.

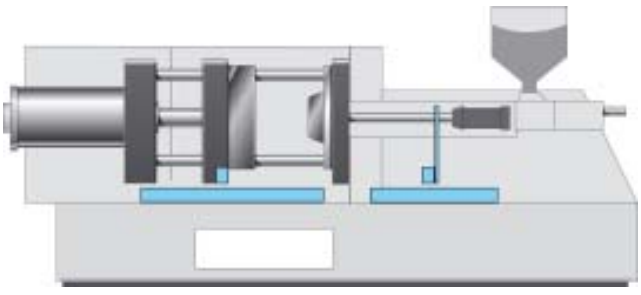
- non-contact detection of the actual position
- IP 67, insensitive to contamination
- wear-free
- insensitive to shock and vibration
- absolute output signal
- direct signal processing or through processor cards for interfacing with any control system or stand-alone operation



From optional to standard

Micropulse transducers have long been standard in the plastics machinery industry on high-precision machines and offered on standard machines as a non-contact option to potentiometric systems.
All that has stood in the way of wide standard use has until now been the comparatively high price.
The Micropulse AT has been designed in cooperation with development engineers from the plastics machinery industry and represents a system that is competitively priced and meets all the technical demands of the industry.
With the introduction of Micropulse AT transducers, downtimes can be reduced to a minimum not just on high-end specialty machines, but even in standard production models.

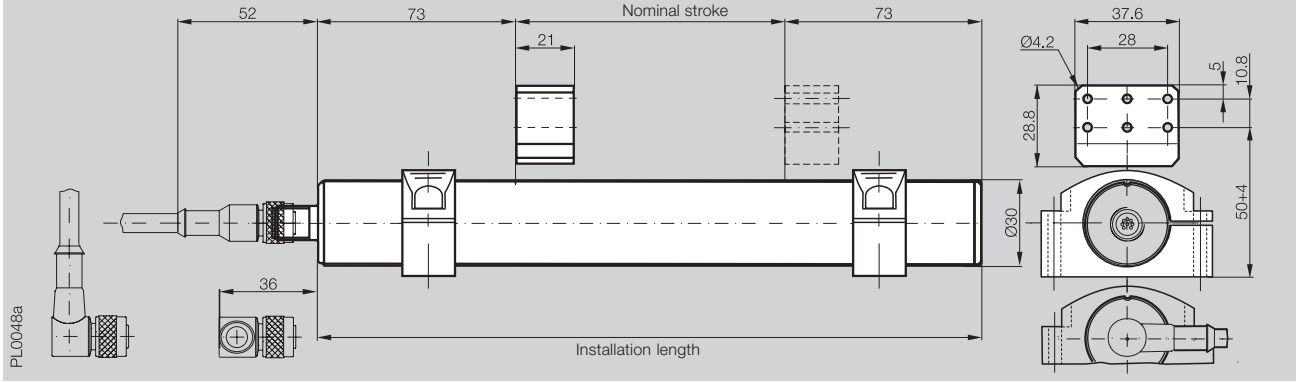
This product is certified in accordance with File No. E227256



Micropulse AT – specifically designed for use in injection molding machines

Series	**BTL6 Profile A1**

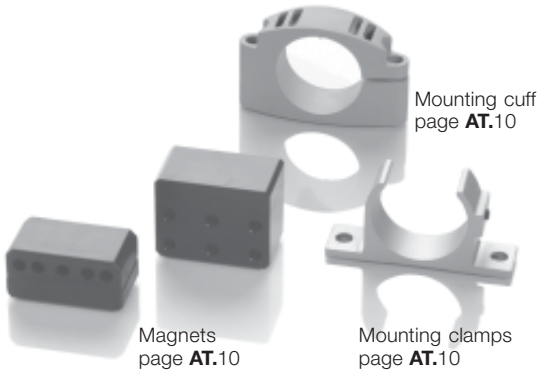
Transducer with floating magnet, S115 connection with BKS-S115/BKS-S116 connector for transducers with analog interface and digital pulse interface Page AT.4...AT.6



Ordering code	BTL6-_ _ _-M_ _ _ _-A1-S115 BTL6-**A301**-M_ _ _ _-A1-S115
Shock load	50 g/6 ms per IEC 60068-2-27
Vibration	12 g, 10...2000 Hz per IEC 60068-2-6
Polarity reversal protected	yes
Overvoltage protection	yes
Enclosure rating per IEC 60529	IP 67 (with BKS-S... IP 67 connector attached)
Housing material	Anodized aluminum
Housing attachment	Mounting clamps
Connection type	Connector M12, 8-pin standard
EMC testing:	
RF emission	EN 55011 Group 1, Class A+B
Static electricity (ESD)	IEC 61000-4-2 Severity Level 3
Electromagnetic fields (RFI)	IEC 61000-4-3 Severity Level 3
Fast transients (BURST)	IEC 61000-4-4 Severity Level 3
Line-carried noise, induced by high-frequency fields	IEC 61000-4-6 Severity Level 3 IEC 61000-4-8 Severity Level 4

▶ Included:
- Transducers (select your interface from page **AT.**5 to **AT.**9)
- Short user's guide

Please order separately:
Magnets page **AT.**10
Mounting clamps/cuff page **AT.**10
Connectors page **BKS**.8



BTL AT
General data Profil series A1
Digital pulse interface P11_
Analog interface Profile series A1
Modes
Analog interface Profile series A1
Accessories Profile series A1
BKS
Page BKS.8

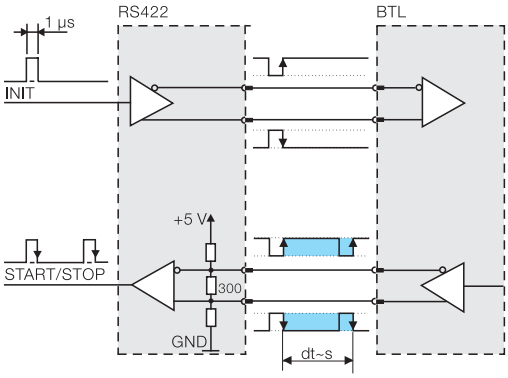
P110-Interface

Compatible with BTA processors and various OEM controls, e.g. Siemens, B & R, Bosch, Phoenix Contact, Mitsubishi, Sigmatek, Parker, Esitron, WAGO etc.. Reliable signal transmission, even over cable lengths up to 500 m between BTA and BTL, is assured by the especially noise-immune RS485 differential drivers and receivers. Noise signals are effectively suppressed.

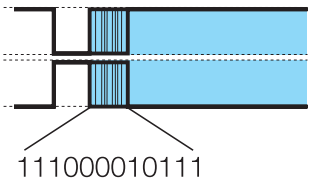
P110 replaces P1 and M1

Based on differing philosophies, two controller-specific interfaces have been established for the digital pulse versions.
The difference lies in how the edges are processed.

In the "P" interface the falling edges and in the "M" interface the rising edges are processed.
To reduce the amount of part numbers, the "P110 interface" has been developed which combines both functions.
The reference point for the propagation time measurement is the "Start" pulse.



Block diagram of P-interface



P111 Interface Cost savings using DPI/IP for start-up and installation

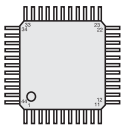
DPI/IP is a protocol for direct data interchange between a controller and transducer. The signal lines are used to send additional information such as manufacturer, stroke length and waveguide gradient. This allows start-up or replacement of a transducer without having to make manual changes in the controller parameters.
The first to integrate these functions were the controls from Sigmatek.

Features

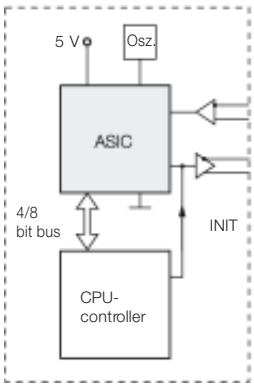
- Bi-directional communication
- Transducer controlled using Init and Start/Stop signals
- Integrated diagnostic functions
- Plug and Play
- Automatic parameterizing reduces downtimes
- Sending of sensor model, stroke length, specific parameters
- Measurement length up to 3250 mm

Extremely precise digitizing chip for P110 pulse interface

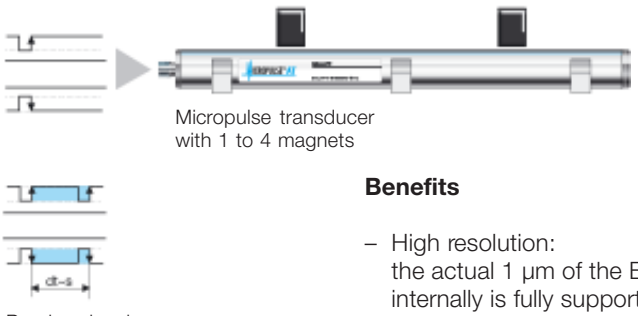
Companies developing their own control and processing electronics can create a highly accurate P-interface cost effectively and with a minimum of effort using the Balluff digitizing chip. The digitizing chip was developed as a high-resolution, configurable ASIC for the Micropulse P-interface.



Digitizing chip 44QFP



Controller or
Processing electronics



P pulse signal

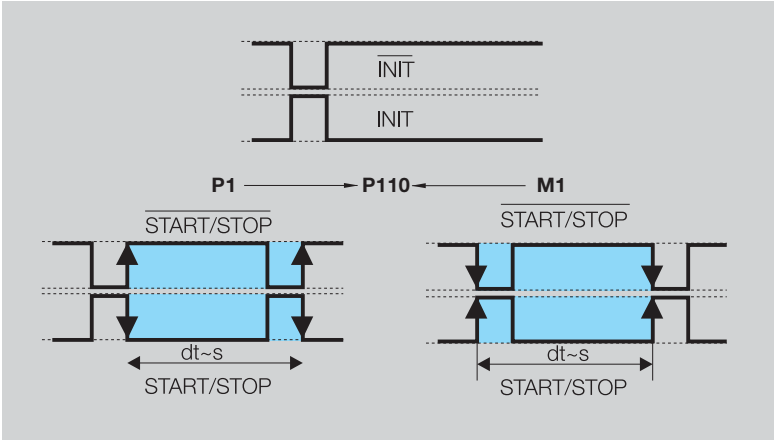
Micropulse transducer
with 1 to 4 magnets

Benefits

- High resolution: the actual 1 µm of the BTL internally is fully supported by the 133 ps resolution of the chip (at low clock frequency 2 or 20 MHz)
- Position data from 4 magnets can be processed simultaneously
- 4/8-bit processor interface

ASIC INFO:
+49 (0) 71 58/1 73-2 41

Series	BTL6 Profile A1
Transducer interface	Pulse **P110**
Input interface	Pulse **P110**



Ordering code	BTL6-**P110**-M_ _ _ _-A1-S115
System resolution	processing-dependent
Repeatability	≤ 10 µm
Repeat accuracy	≤ 20 µm
Resolution	≤ 10 µm
non-linearity	≤ ±200 µm up to 500 mm nominal stroke
	typ. ±0.02 %, max. ±0.04 % 500...1500 mm nominal stroke
Supply voltage	20...28 V DC
Current draw	≤ 60 mA (at 1kHz)
Operating temperature	0...+70 °C
Storage temperature	–40...+100 °C

Pin assignments		Pin	BTL6-**P11_**-M...
In-/output signals	Input	1	INIT
	Output	2	START/STOP
	Input	3	$\overline{\text{INIT}}$
	Output	5	$\overline{\text{START/STOP}}$
Supply voltage		6	GND
		7	+24 V DC

Connect shield to housing,
pins 4 and 8 must remain unconnected.

▶ Please enter code for nominal stroke in ordering code!

▶ Preferred models interface P11_
BTL6-P11_-M_ _ _ _-A1-S115
highlighted in blue are available from stock.

▶ Included:
– Transducer
– Short user's guide

Please order separately:
Magnets page **AT.**10
Mounting clamps/cuff page **AT.**10
Connectors page **BKS.**8

Ordering example:
BTL6-P11_-M_ _ _ _-A1-S115

Data Protocol		**Standard nominal strokes [mm]**
0	without DPI/IP* (standard)	0050, 0075, 0100, 0130, 0150, 0160, 0175, 0200, 0225, 0250, 0300, 0350, 0360, 0400, 0450, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1250, 1300, 1400, 1500, 1700, 2000, 2100, 2500, 2800, 3000, 3250, on request in 25 mm increments
1	with DPI/IP	

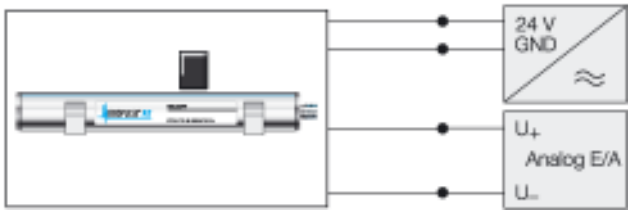
*the version without DPI/IP
is only available up to a nominal stroke of 1500

BTL AT
General Data Profile series A1
Digital pulse interface P11_
Analog interface Profile series A1
Modes
Analog interface Profile series A1
Accessories Profile series A1
BKS
Page **BKS.**8

The non-contact "Pot"

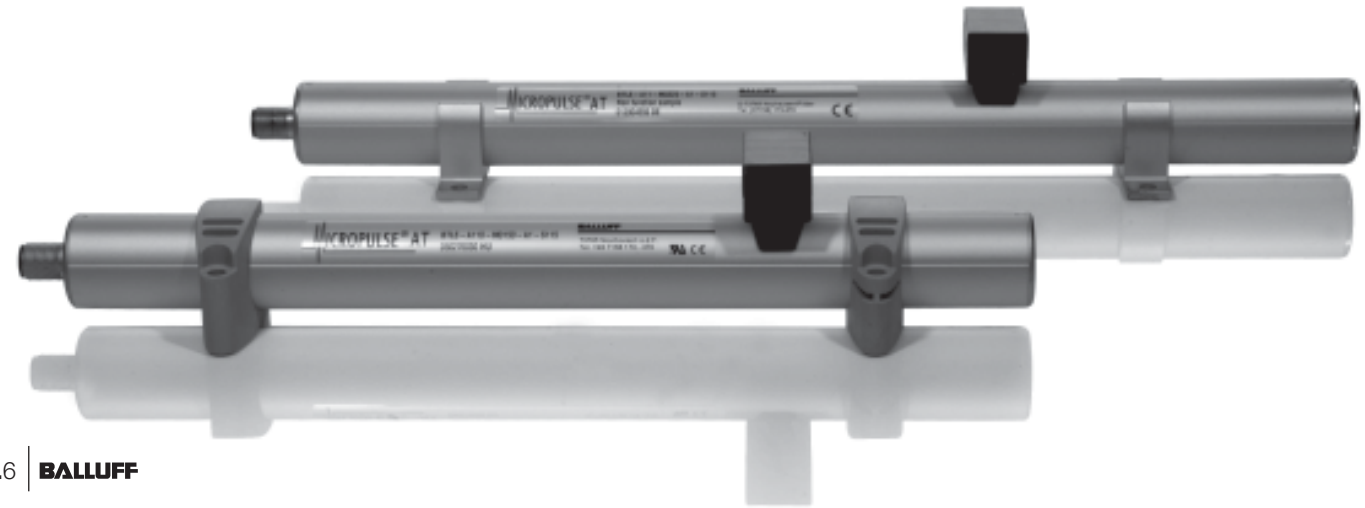
The analog outputs of the standard series BTL6-A110 are potential non-isolated.

Potentiometer connections, block diagram

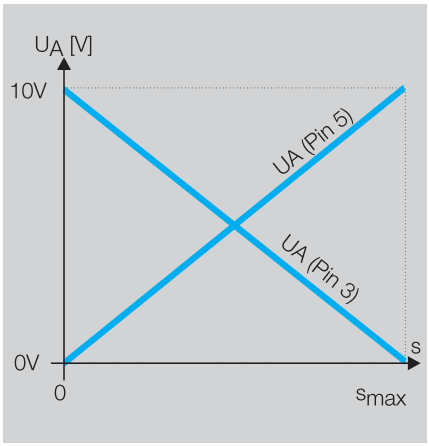


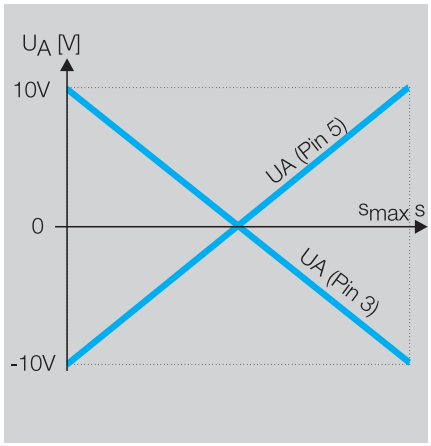
Micropulse transducer connections, block diagram

BTL6 transducers exist in the variants 0...10 V and –10...10 V with rising and falling characteristics. The version –10...10 V generally has potential isolated output signals.



Series	BTL6 Profile A1	BTL6 Profile A1
Output signal	analog	analog
Transducer interface	**A**	**G**
Input interface	analog	analog





Ordering code	BTL6-**A110**-M_ _ _ _-A1-S115	BTL5-**G310**-M_ _ _ _-A1-S115
Output voltage	**0...10 V and 10...0 V**	**–10...10 V and 10...–10 V**
Load current	max. 5 mA	max. 5 mA
max. ripple	≤ 5 mV	≤ 5 mV
System resolution	≤ 10 µm	≤ 10 µm
Repeatability	≤ 10 µm	≤ 10 µm
Repeat accuracy	≤ 20 µm	≤ 20 µm
Sampling rate	$f_{STANDARD}$ = 1 kHz	$f_{STANDARD}$ = 1 kHz
non-linearity	≤ ±200 µm to 500 mm nominal stroke typ. ±0.02 %, max. ±0.04 % 500...1500 mm nominal stroke	≤ ±200 µm to 500 mm nominal stroke typ. ±0.02 %, max. ±0.04 % 500...1500 mm nominal stroke
Supply voltage	20...28 V DC	20...28 V DC
Current draw	≤ 70 mA	≤ 70 mA
Polarity reversal protected	yes	yes
Operating temperature	0...+70 °C	0...+70 °C
Storage temperature	–40...+100 °C	–40...+100 °C

Pin assignments	Pin	BTL6-**A110**.../**A310**	BTL6-**G310**...
Output signals	1	0 V Output	0 V Output
	2	0 V Output	0 V Output
	3	10...0 V	–10...10 V
	5	0...10 V	10...–10 V
Supply voltage	6	GND	GND
	7	+24 V DC	+24 V DC

Connect shield to housing,
pins 4 and 8 must remain unconnected.

▶ Please enter code for nominal stroke in ordering code!

▶ Preferred models
BTL6-_ _ 10-M_ _ _ _-A1-S115 highlighted in blue are available from stock.

▶ Included:
– Transducer
– Short user's guide

Please order separately:
Magnets page **AT.**10
Mounting clamps/cuff page **AT.**10
Connectors page **BKS.**8

Ordering example:
BTL6-_ _ 10-M_ _ _ _-A1-S115

Data Protocol
A 0...10 V
10...0 V
G –10...10 V
10...–10 V

Output signal
1 potential equalized*
3 potential isolated

Standard nominal strokes [mm]
0100, 0130, 0150, 0160, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0360, 0375, 0400, 0425, 0450, 0475, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1250, 1300, 1400, 1500, on request in 25 mm increments

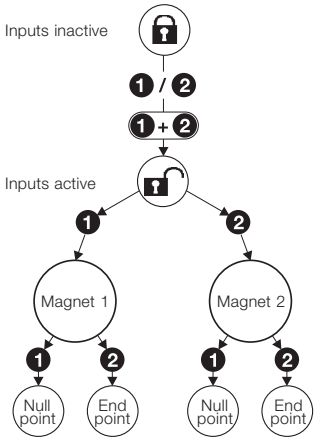
*only for BTL6-A110-M_ _ _ _-A1-S115

BTL AT
General Data Profile series A1
Digital pulse interface P11_
Analog interface Profile series A1
Modes
Analog interface Profile series A1
Accessories Profile series A1
BKS
Page **BKS.**8

BTL6-A301-...
2 in 1

Two moving members on a machine often travel in the same direction. Each axis normally requires a separate feedback sensor.
With the Micropulse AT you can now sense both movements at the same time with just one transducer having 2 analog outputs.
The position of the respective null and end points can be set individually using 2 programmable inputs.

The two ranges may be adjacent, may overlap, and can be programmed for a rising or falling output signal.
The transducer can be operated using one or two magnets.
If one magnet leaves the programmed range or if only one is present, the position is indicated on Output 1.
Output 2 then indicates an error value.



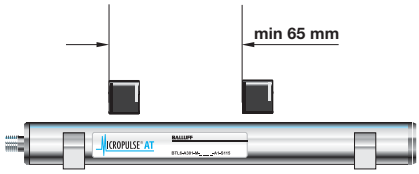
Example: Programming steps for setting the measurement range

Mode selection

The standard function is separate measurement of two positions. The programming inputs are used to switch the mode.

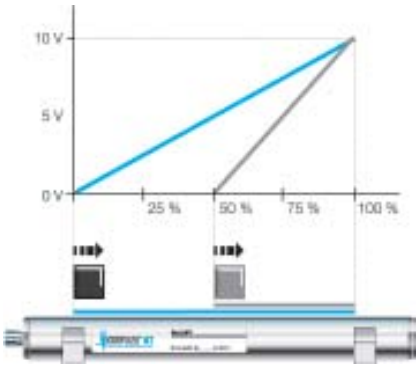
Teach-in

Used for changing the factory set null and end point with a new null and end point. First the magnet must be brought to the new null point and then to the new end position, and the respective values stored by pressing the button.

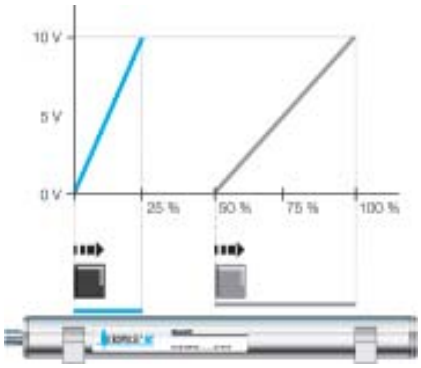


The separation between two magnets should not generally be less than 65 mm.

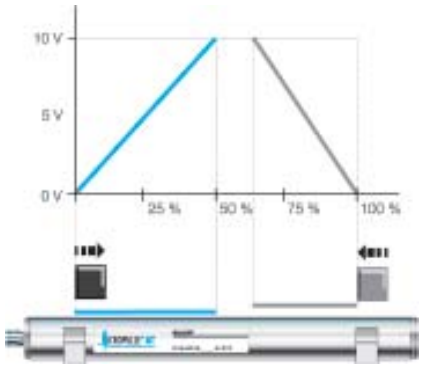
Mode 1: Single measurement of 2 positions (single measurement default setting 100 %/50 %)



Basic default setting

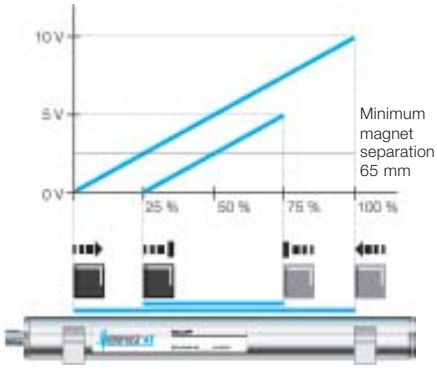


Programming example:
Output 1: 25 % nominal stroke, signal rising
Output 2: 50 % nominal stroke, signal rising

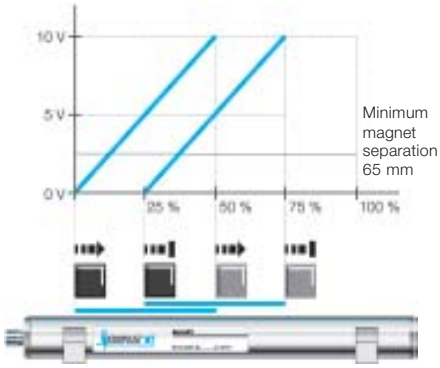


Programming example:
Output 1: 50 % nominal stroke, signal rising
Output 2: 37.5 % nominal stroke, signal falling

Mode 2: Differential measurement between 2 magnets

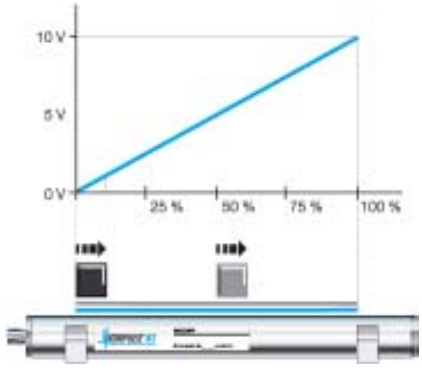


Default setting: Differential measurement
Output 1: Standard travel signal (not shown)
Output 2:
differential signal 100 % nominal stroke = 10 V
Programming example: Differential
travel 50 % nominal stroke = 5 V differential signal



Programming example: Differential
travel 50 % nominal stroke = 10 V differential signal

Mode 3: Single measurement (both magnets 0...100 %)



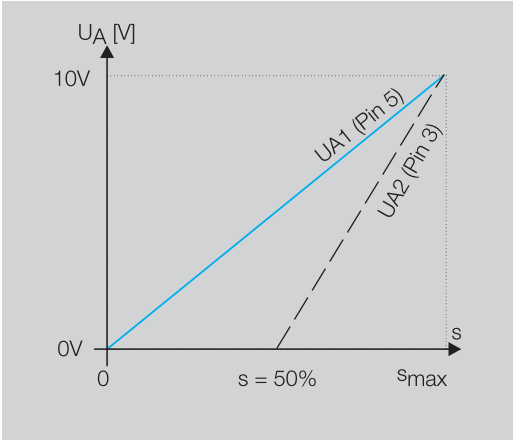
Series	**BTL6 Profile A1**
Output signal	analog
Transducer interface	**A**
Input interface	analog

Features of Micropulse BTL6-A

- 100 % adjustment of analog signal
- Error signal: No magnet in measuring area, transducer in calibration mode
- LED indicator for programming assistance
- Separate teach-in for all zero and span points
- Freely selectable single position or differential measurement

Measure two motions with one system

- One transducer senses two motions at the same time
- Significant cost reduction, half the installation costs
- two 0...10 V analog outputs



Ordering code	BTL6-**A301**-M_ _ _ _-A1-S115
Output voltage	**0...10 V programmable**
Load current	max. 5 mA
max. ripple	≤ 5 mV
System resolution	≤ 10 µm
Repeatability	≤ 10 µm
Repeat accuracy	≤ 20 µm
Sampling rate	$f_{STANDARD}$ = 1 kHz (< 850 mm)
non-linearity	≤ ±200 µm to 500 mm nominal stroke typ. ±0.02 %, max. ±0.04 % 500...1500 mm nominal stroke
Supply voltage	18...30 V DC
Current draw	≤ 100 mA
Polarity reversal protected	yes
Operating temperature	0...+70 °C
Storage temperature	–40...+100 °C

Pin assignments pin color*		output	BTL6-**A301**...
signal	1	YE	Programming input L_a
	2	GY	0 V Output
	3	PK	0...10 V, Output 2, programmable
	4	RD	Programming input L_b
	5	GN	0...10 V, Output 1, programmable
Supply voltage	6	BU	GND
	7	BN	+24 V DC

Connect shield to housing, Pin 8 (WH) must remain unconnected.
*Connector with cable BKS-S115/BKS-S116

▶ Please enter code for nominal stroke in ordering code!

▶ Preferred models interface A301
BTL6-A301-M_ _ _ _-A1-S115
highlighted in blue are available from stock.

▶ Included:
– Transducer
– Short user's guide

Please order separately:
Magnets page **AT.**10
Mounting clamps/cuff page **AT.**10

Ordering example:
BTL6-A301-M_ _ _ _-A1-S115

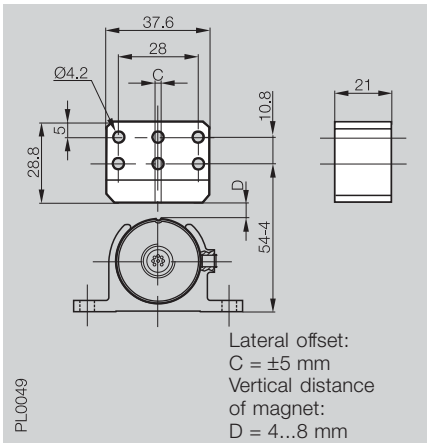
Output signal
potential isolated
2 analog outputs
Single or differential-measurement, rising, falling, zero and end point programmable

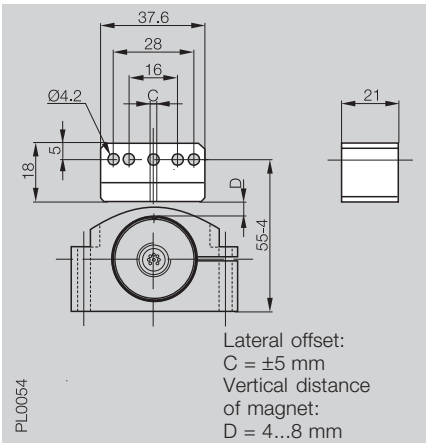
Standard nominal strokes [mm]
0160, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0360, 0375, 0400, 0425, 0450, 0475, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1250, 1300, 1400, 1500, on request in 25 mm increments

Standard nominal strokes (mm)
0050, 0100, 0130, 0150
for single magnet only

BTL AT
General Data Profile series A1
Digital pulse interface P11_
Analog interface Profile series A1
Modes
Analog interface Profile series A1
Accessories Profile series A1

Description	**Magnet**	**Magnet**
for Series	BTL6 Profile A1	BTL6 Profile A1

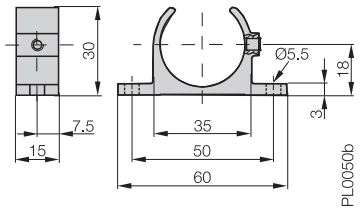




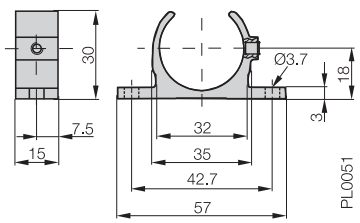
Ordering code	BTL6-A-**3800**-2	BTL6-A-**3801**-2
Housing material	Plastic	Plastic
Weight	ca. 30 g	ca. 25 g
Magnet traverse speed	any	any
Operating temperature/Storage temperature	–40...+85 °C	–40...+85 °C
Included	Magnet	Magnet

The BTL6-A-3800-2 magnet can be operated at a distance of 4...8 mm from the top surface of the profile housing. Together with the mounting clamps BTL6-A-MF01-A-50 and the mounting cuff BTL6-A-MF03-K-50 the mechanical installation is compatible with series BTL5-...-P-S 32 with magnets BTL5-P-3800-2 and BTL5-P-5500-2. This means for example that long stroke lengths or transducers with a bus interface can be interchanged without making any mechanical modifications.

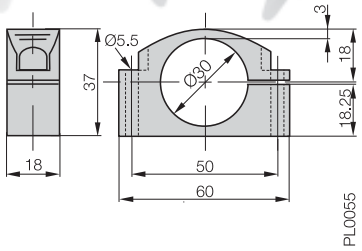
Mounting clamps/cuff



Mounting clamp
Ordering code: BTL6-A-MF01-A-50
Includes: 1 clamp



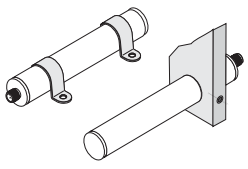
Mounting clamp
Ordering code: BTL6-A-MF01-A-43
Includes: 1 clamp



Mounting cuff
Ordering code: BTL6-A-MF03-K-50
Includes: 1 cuff

When extreme shock and vibration are present, we recommend spacing mounting clamps every 250 mm.

Length (stroke length)	No. of mounting clamps/cuffs
up to 250 mm	2
251 to 500 mm	3
501 to 750 mm	4
751 to 1000 mm	5
1001 to 1250 mm	6
1251 to 1500 mm	7



Custom mounting options

Accessories
Connectors
page **BKS.**8